

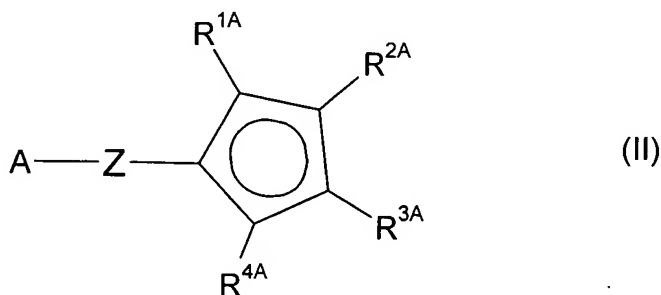
AMENDMENTS TO THE CLAIMS

1. (currently amended) A copolymer of ethylene with α -olefins which has a molar mass distribution M_w/M_n of from 1 to 8, a density of from 0.85 to 0.94 g/cm³, a molar mass M_n of from 10 000 g/mol to 4 000 000 g/mol and a CDBI of less than 50%, and in which ~~the~~ side chain branching of the maxima of the individual peaks of ~~the~~ side chain branching distribution is in each case greater than 5 CH₃/1 000 carbon atoms.
2. (currently amended) ~~A~~The copolymer of ethylene with α -olefins as claimed in claim 1 ~~which has an at least bimodal~~ wherein the side chain branching distribution is at least bimodal.
3. (currently amended) ~~A~~The copolymer of ethylene with α -olefins as claimed in claim 1 ~~or 2 which has a~~ wherein the molar mass M_n of is from 150 000 g/mol to 1 000 000 g/mol.
4. (currently amended) ~~A~~The copolymer of ethylene with α -olefins as claimed in ~~any of claims 1 to 3~~claim 1 which has at least one peak in ~~the~~ Crystaf® spectrum of ~~the~~ differential distribution in the range from 15 to 40°C and at least one further peak in the Crystaf® spectrum of the differential distribution in the range from 25 to 80°C.
5. (currently amended) ~~A~~The copolymer of ethylene with α -olefins as claimed in ~~any of claims 2 to 4~~claim 2 in which the side chain branching distribution is bimodal or trimodal.
6. (currently amended) A process for preparing ethylene copolymers having a molar mass distribution M_w/M_n of from 1 to 8, a density of from 0.85 to 0.94 g/cm³, a molar mass M_n of from 10 000 g/mol to 4 000 000 g/mol and a CDBI of less than 50%, and in which a side chain branching of the maxima of the individual peaks of a side chain branching distribution is in each case greater than 5 CH₃/1 000 carbon atoms ~~as claimed in any of~~

claims 1 to 5, which comprises the process comprising polymerizing ethylene with α -olefins in the presence of the following components:

- A) at least one monocyclopentadienyl complex comprising the structural feature of the formula $(\text{Cp-Z-A})\text{Cr}$ (I), where the variables have the following meanings:

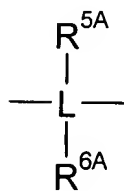
Cp-Z-A is a ligand of the formula (II):



where

$\text{R}^{1\text{A}}\text{-R}^{4\text{A}}$ are each, independently of one another, hydrogen, $\text{C}_1\text{-C}_{20}$ -alkyl, $\text{C}_2\text{-C}_{20}$ -alkenyl, $\text{C}_6\text{-C}_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part, $\text{NR}^{11\text{A}}_2$, $\text{N}(\text{SiR}^{11\text{A}}_3)_2$, $\text{OR}^{11\text{A}}$, $\text{OSiR}^{11\text{A}}_3$, $\text{SiR}^{11\text{A}}_3$, $\text{BR}^{11\text{A}}_2$, where the organic radicals $\text{R}^{1\text{A}}\text{-R}^{4\text{A}}$ may also be substituted by halogens and where at least two of the vicinal radicals $\text{R}^{1\text{A}}\text{-R}^{4\text{A}}$ are joined to form a five- or six-membered ring, and/or two vicinal radicals $\text{R}^{1\text{A}}\text{-R}^{4\text{A}}$ are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S[[.]];

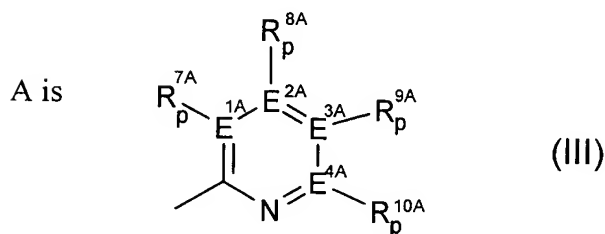
Z is a bridge between A and Cp having the formula:



where

L is carbon or silicon, ~~preferably carbon,~~

R^{5A}, R^{6A} are each hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11A}_3 , where the organic radicals R^{5A} and R^{6A} may also be substituted by halogens and R^{5A} and R^{6A} may also be joined to form a five- or six-membered ring[$[,]$];



where

$E^{1A}-E^{4A}$ are each carbon or nitrogen,

$R^{7A}-R^{10A}$ are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11A}_3 , where the organic radicals $R^{7A}-R^{10A}$ may also bear halogens or nitrogen or further C_1 - C_{20} -alkyl groups, C_2 - C_{20} -alkenyl groups, C_6 - C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11A}_3 as substituents and two vicinal radicals $R^{7A}-R^{10A}$ or R^{7A} and Z may also be joined to form a five- or six-membered ring,

R^{11A} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the

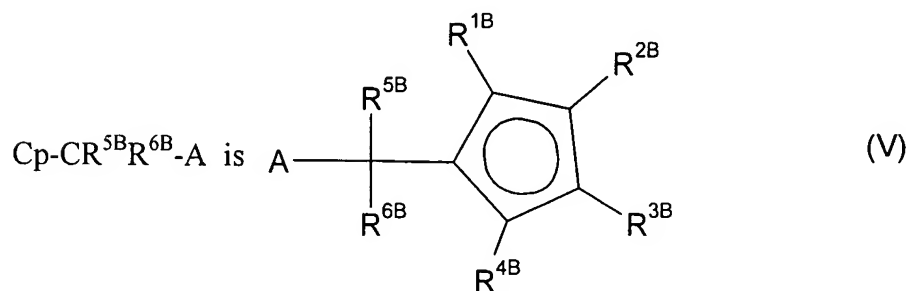
alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals R^{1A} may also be joined to form a five- or six-membered ring, and

p is 0 when $E^{1A}-E^{4A}$ is nitrogen and is 1 when $E^{1A}-E^{4A}$ is carbon[[,]];

- B) optionally an organic or inorganic support[[,]];
 - C) optionally ~~one or more activating compounds~~ at least one activating compound; and
 - D) optionally ~~one or more~~ at least one metal compounds compound containing a metal of group 1, 2 or 13 of the Periodic Table.

7. (currently amended) A catalyst system for olefin polymerization comprising

A') at least one monocyclopentadienyl complex A') comprising the structural feature of ~~the~~ formula $(Cp-CR^{5B}R^{6B}-A)Cr$ (IV), where the variables have the following meanings:

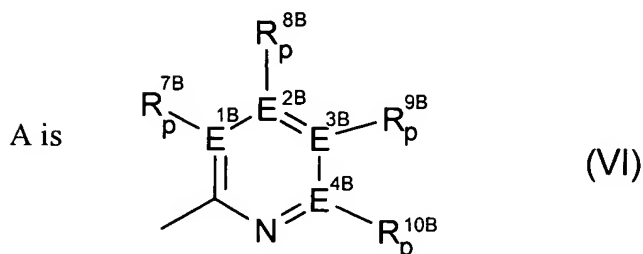


where

$R^{1B}-R^{4B}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical, NR^{5A}_2 , $N(SiR^{11B}_3)_2$, OR^{11B} , $OSiR^{11B}_3$, SiR^{11B}_3 , BR^{11B}_2 , where the organic radicals

$R^{1B}-R^{4B}$ may also be substituted by halogens and two vicinal radicals R^{1B} - R^{4B} may also be joined to form a five- or six-membered ring,

R^{5B}, R^{6B} are each hydrogen or methyl[$[\cdot, \cdot]$];



where

$E^{1B}-E^{4B}$ are each carbon or nitrogen,

$R^{7B}-R^{10B}$ are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 , where the organic radicals $R^{7B}-R^{10B}$ may also bear halogens or nitrogen or further C_1 - C_{20} -alkyl groups, C_2 - C_{20} -alkenyl groups, C_6 - C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 as substituents and two vicinal radicals $R^{7B}-R^{10B}$ may also be joined to form a five- or six-membered ring,

R^{11B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{11B} may also be joined to form a five- or six-membered ring,

p is 0 when $E^{1B}-E^{4B}$ is nitrogen and is 1 when $E^{1B}-E^{4B}$ is carbon,

where at least one radical $R^{7B}-R^{10B}$ is C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 and the organic radicals $R^{7B}-R^{10B}$ may also bear halogens or nitrogen or further C_1-C_{20} -alkyl groups, C_2-C_{20} -alkenyl groups, C_6-C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 as substituents and two vicinal radicals $R^{7B}-R^{10B}$ may also be joined to form a five- or six-membered ring or at least one $E^{1B}-E^{4B}$ is nitrogen[[,]];

B) optionally an organic or inorganic support[[,]];

C) optionally ~~one or more activating compounds~~ at least one activating compound; and

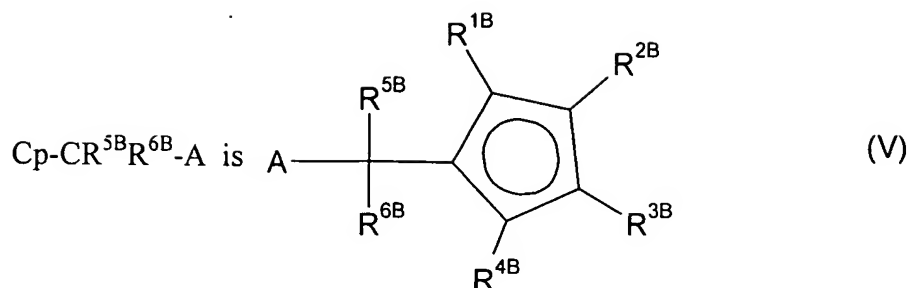
D) optionally ~~one or more metal compounds~~ at least one metal compound containing a metal of group 1, 2 or 13 of the Periodic Table.

8. (currently amended) ~~A~~The catalyst system for olefin polymerization as claimed in claim 7, wherein two vicinal radicals $R^{1B}-R^{4B}$ in the monocyclopentadienyl complex A') form a fused ring system.

9. (currently amended) A prepolymerized catalyst system comprising a catalyst system ~~as claimed in claim 7 or 8~~

comprising:

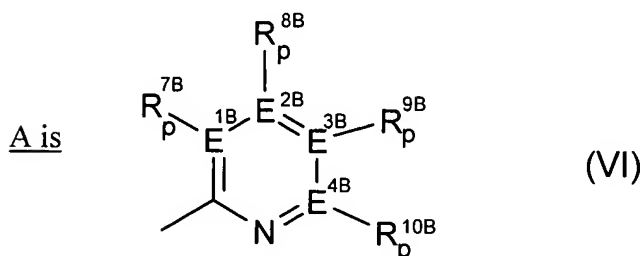
A') at least one monocyclopentadienyl complex A') comprising the structural feature of a formula $(Cp-CR^{5B}R^{6B}-A)Cr$ (IV), where the variables have the following meanings:



where

$\text{R}^{1\text{B}}\text{-R}^{4\text{B}}$ are each, independently of one another, hydrogen, $\text{C}_1\text{-C}_{20}\text{-alkyl}$, $\text{C}_2\text{-C}_{20}\text{-alkenyl}$, $\text{C}_6\text{-C}_{20}\text{-aryl}$, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical, $\text{NR}^{5\text{A}}_2$, $\text{N}(\text{SiR}^{11\text{B}}_3)_2$, $\text{OR}^{11\text{B}}$, $\text{OSiR}^{11\text{B}}_3$, $\text{SiR}^{11\text{B}}_3$, $\text{BR}^{11\text{B}}_2$, where the organic radicals $\text{R}^{1\text{B}}\text{-R}^{4\text{B}}$ may also be substituted by halogens and two vicinal radicals $\text{R}^{1\text{B}}\text{-R}^{4\text{B}}$ may also be joined to form a five- or six-membered ring,

$\text{R}^{5\text{B}}, \text{R}^{6\text{B}}$ are each hydrogen or methyl;



where

$\text{E}^{1\text{B}}\text{-E}^{4\text{B}}$ are each carbon or nitrogen,

$\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ are each, independently of one another, hydrogen, $\text{C}_1\text{-C}_{20}\text{-alkyl}$, $\text{C}_2\text{-C}_{20}\text{-alkenyl}$, $\text{C}_6\text{-C}_{20}\text{-aryl}$, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or $\text{SiR}^{11\text{B}}_3$, where the organic radicals $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ may also bear halogens or nitrogen or further $\text{C}_1\text{-C}_{20}\text{-alkyl}$ groups, $\text{C}_2\text{-C}_{20}\text{-alkenyl}$ groups, $\text{C}_6\text{-C}_{20}\text{-aryl}$ groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and

6-20 carbon atoms in the aryl part or $\text{SiR}^{11\text{B}}_3$ as substituents and two vicinal radicals $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ may also be joined to form a five- or six-membered ring,

$\text{R}^{11\text{B}}$ are each, independently of one another, hydrogen, $\text{C}_1\text{-C}_{20}\text{-alkyl}$, $\text{C}_2\text{-C}_{20}\text{-alkenyl}$, $\text{C}_6\text{-C}_{20}\text{-aryl}$ or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals $\text{R}^{11\text{B}}$ may also be joined to form a five- or six-membered ring,

p is 0 when $\text{E}^{1\text{B}}\text{-E}^{4\text{B}}$ is nitrogen and is 1 when $\text{E}^{1\text{B}}\text{-E}^{4\text{B}}$ is carbon,

where at least one radical $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ is $\text{C}_1\text{-C}_{20}\text{-alkyl}$, $\text{C}_2\text{-C}_{20}\text{-alkenyl}$, $\text{C}_6\text{-C}_{20}\text{-aryl}$, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or $\text{SiR}^{11\text{B}}_3$ and the organic radicals $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ may also bear halogens or nitrogen or further $\text{C}_1\text{-C}_{20}\text{-alkyl}$ groups, $\text{C}_2\text{-C}_{20}\text{-alkenyl}$ groups, $\text{C}_6\text{-C}_{20}\text{-aryl}$ groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or $\text{SiR}^{5\text{C}}_3$ as substituents and two vicinal radicals $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ may also be joined to form a five- or six-membered ring or at least one $\text{E}^{1\text{B}}\text{-E}^{4\text{B}}$ is nitrogen;

B) optionally an organic or inorganic support;

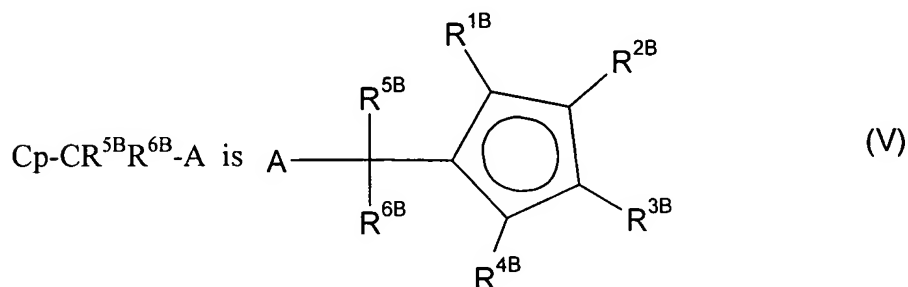
C) optionally at least one activating compound; and

D) optionally at least one activating compound containing a metal of group 1, 2 or 13 of the Periodic Table;

and linear $\text{C}_2\text{-C}_{10}\text{-1-alkenes}$ polymerized onto it in a mass ratio of from 1:0.1 to 1:200.

10. (currently amended) The use of a catalyst system as claimed in any of claims 7 to 9 for the polymerization or copolymerization of ethylene with α -olefins. A process comprising polymerizing or copolymerizing ethylene with α -olefins in the presence of a catalyst system comprising:

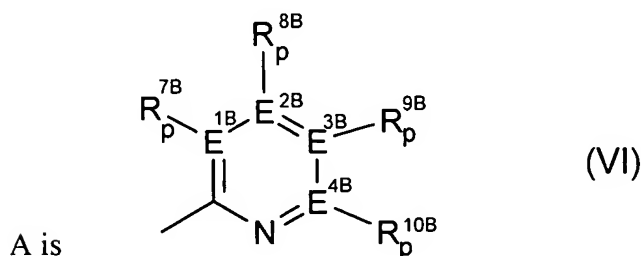
A') at least one monocyclopentadienyl complex A') comprising a structural feature of the formula (Cp-CR^{5B}R^{6B}-A)Cr (IV), where the variables have the following meanings:



where

R^{1B}-R^{4B} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical, NR^{5A}₂, N(SiR^{11B}₃)₂, OR^{11B}, OSiR^{11B}₃, SiR^{11B}₃, BR^{11B}₂, where the organic radicals R^{1B}-R^{4B} may also be substituted by halogens and two vicinal radicals R^{1B}-R^{4B} may also be joined to form a five- or six-membered ring,

R^{5B}, R^{6B} are each hydrogen or methyl;



where

$E^{1B}-E^{4B}$ are each carbon or nitrogen,

$R^{7B}-R^{10B}$ are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 , where the organic radicals $R^{7B}-R^{10B}$ may also bear halogens or nitrogen or further C_1-C_{20} -alkyl groups, C_2-C_{20} -alkenyl groups, C_6-C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 as substituents and two vicinal radicals $R^{7B}-R^{10B}$ may also be joined to form a five- or six-membered ring,

R^{11B} are each, independently of one another, hydrogen, C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{11B} may also be joined to form a five- or six-membered ring,

p is 0 when $E^{1B}-E^{4B}$ is nitrogen and is 1 when $E^{1B}-E^{4B}$ is carbon,

where at least one radical $R^{7B}-R^{10B}$ is C_1-C_{20} -alkyl, C_2-C_{20} -alkenyl, C_6-C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 and the organic radicals $R^{7B}-R^{10B}$ may also bear halogens or nitrogen or further C_1-C_{20} -alkyl groups, C_2-C_{20} -alkenyl groups, C_6-C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{5C}_3 as substituents and two vicinal radicals $R^{7B}-R^{10B}$ may also be joined to form a five- or six-membered ring or at least one $E^{1B}-E^{4B}$ is nitrogen;

B) optionally an organic or inorganic support;

C) optionally at least one activating compound; and

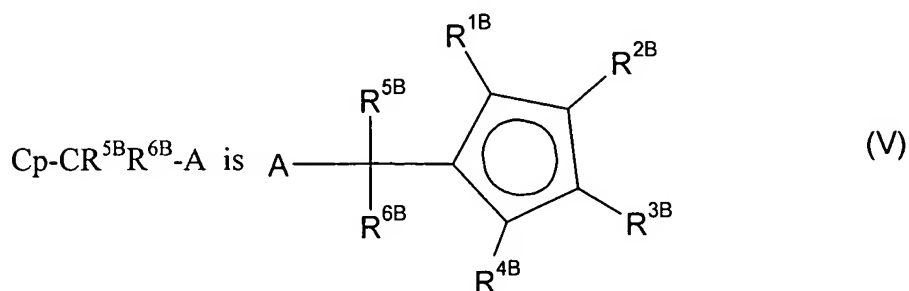
D) optionally at least one metal compound containing a metal of group 1, 2 or 13 of the Periodic Table.

11. (currently amended) A process for preparing ~~ethylene copolymers as claimed in any of claims 1 to 4~~

a copolymer of ethylene with α -olefins which has a molar mass distribution M_w/M_n of from 1 to 8, a density of from 0.85 to 0.94 g/cm³, a molar mass M_n of from 10 000 g/mol to 4 000 000 g/mol and a CDBI of less than 50% and in which a side chain branching of the maxima of the individual peaks of a side chain branching distribution is in each case greater than 5 CH₃/1 000 carbon atoms

~~, which comprises the process comprising polymerizing ethylene with α -olefins in the presence of a catalyst system as claimed in any of claims 7 to 9 comprising:~~

A') at least one monocyclopentadienyl complex A') comprising the structural feature of a formula (Cp- CR^{5B}R^{6B}-A)Cr (IV), where the variables have the following meanings:



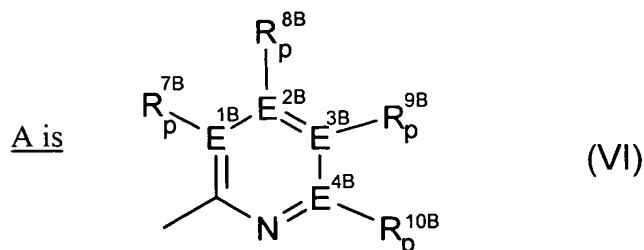
where

R^{1B}-R^{4B} are each, independently of one another, hydrogen, C₁-C₂₀-alkyl, C₂-C₂₀-alkenyl, C₆-C₂₀-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical, NR^{5A}₂,

N(SiR^{11B}₃)₂, OR^{11B}, OSiR^{11B}₃, SiR^{11B}₃, BR^{11B}₂, where the organic radicals

R^{1B} - R^{4B} may also be substituted by halogens and two vicinal radicals R^{1B} - R^{4B} may also be joined to form a five- or six-membered ring,

R^{5B} , R^{6B} are each hydrogen or methyl;



where

E^{1B} - E^{4B} are each carbon or nitrogen,

R^{7B} - R^{10B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 , where the organic radicals R^{7B} - R^{10B} may also bear halogens or nitrogen or further C_1 - C_{20} -alkyl groups, C_2 - C_{20} -alkenyl groups, C_6 - C_{20} -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR^{11B}_3 as substituents and two vicinal radicals R^{7B} - R^{10B} may also be joined to form a five- or six-membered ring,

R^{11B} are each, independently of one another, hydrogen, C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals R^{11B} may also be joined to form a five- or six-membered ring,

p is 0 when E^{1B} - E^{4B} is nitrogen and is 1 when E^{1B} - E^{4B} is carbon,

where at least one radical R^{7B} - R^{10B} is C_1 - C_{20} -alkyl, C_2 - C_{20} -alkenyl, C_6 - C_{20} -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in

the aryl part or $\text{SiR}^{11\text{B}}_3$ and the organic radicals $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ may also bear halogens or nitrogen or further $\text{C}_1\text{-C}_{20}$ -alkyl groups, $\text{C}_2\text{-C}_{20}$ -alkenyl groups, $\text{C}_6\text{-C}_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or $\text{SiR}^{5\text{C}}_3$ as substituents and two vicinal radicals $\text{R}^{7\text{B}}\text{-R}^{10\text{B}}$ may also be joined to form a five- or six-membered ring or at least one $\text{E}^{1\text{B}}\text{-E}^{4\text{B}}$ is nitrogen;

B) optionally an organic or inorganic support;

C) optionally at least one activating compound; and

D) optionally at least one metal compound containing a metal of group 1, 2 or 13 of the Periodic Table.

12. (currently amended) ~~A~~The process as claimed in claim 11, wherein the polymerization is carried out using, as monomers, a monomer mixture which comprises at least one of ethylene and/or $\text{C}_3\text{-C}_{12}$ -1-alkenes and contains at least 50 mol% of ethylene.

13. (currently amended) A polymer mixture comprising

(E) ~~from 1 to 99% by weight of one or more~~at least one ethylene copolymerscopolymer ~~as claimed in any of claims 1 to 5~~having a molar mass distribution M_w/M_n of from 1 to 8, a density of from 0.85 to 0.94 g/cm³, a molar mass M_n of from 10 000 g/mol to 4 000 000 g/mol and a CDBI of less than 50% and in which a side chain branching of the maxima of the individual peaks of a side chain branching distribution is in each case greater than 5 $\text{CH}_3/1\ 000$ carbon atoms;

and

(F) from 1 to 99% by weight of a polymer which is different from (E),
where the percentages by weight are based on the total mass of the polymer mixture.

14. (currently amended) A fiber, film or molding comprising an ethylene copolymer as ~~claimed in any of claims 1 to 5~~having a molar mass distribution M_w/M_n of from 1 to 8, a

density of from 0.85 to 0.94 g/cm³, a molar mass M_n of from 10 000 g/mol to 4 000 000 g/mol and a CDBI of less than 50% and in which a side chain branching of the maxima of the individual peaks of a side chain branching distribution is in each case greater than 5 CH₃/1 000 carbon atoms.

15. (new) The process of claim 6 where L is carbon.